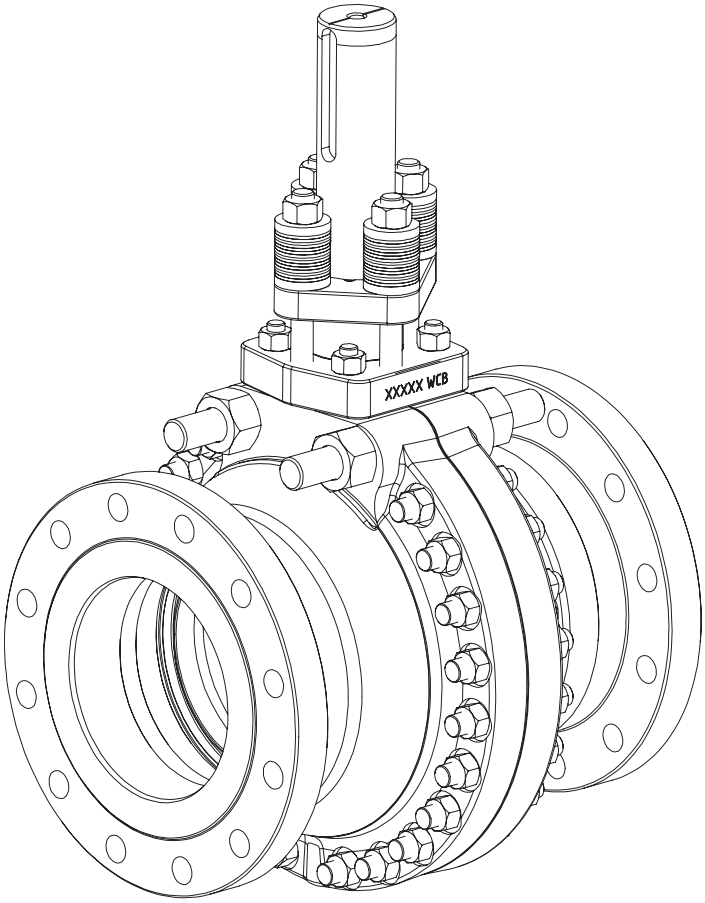
neles

BALL VALVE

Series D

Installation, Maintenance and
Operating Instructions



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READ THESE INSTRUCTIONS FIRST!
These instructions provide information about safe handling and operation of the valve.
If you require additional assistance, please contact the manufacturer or manufacturer's representative. Addresses and phone numbers are printed on the back cover.
See also www.metso.com/valves for the latest documentation.
SAVE THESE INSTRUCTIONS!

1 GENERAL

1.1 Scope of the manual

This manual provides the essential information about the use of series D ball valves. For more information on actuators and other equipment, which are covered only briefly, please refer to the separate manuals on their installation, use and maintenance.

NOTE:
Selection and use of the valve in a specific application requires close consideration of detailed aspects. E.g. Q2G-trim is for relatively clean gas applications, note possibility of clogging. Due to the nature of the product, this manual cannot cover all the individual situations that may occur when installing, using or servicing the valve.

If you are uncertain about use of the valve or its suitability for your intended purpose, please contact Metso for more information.

For valves in oxygen service, please see also the separate installation, maintenance and operating instructions for oxygen service (see Metso document id:10O270EN.pdf).

1.2 Valve description

Series D valves are flanged ball valves. The body consists of two symmetrical parts which are attached to each other with screws. The ball and stem are of one piece. Large low-friction bearings ensure reliability and long maintenance intervals. The valves have spring-loaded seats which are either soft or made of metal.

The valves can be used for shut-off and control applications.

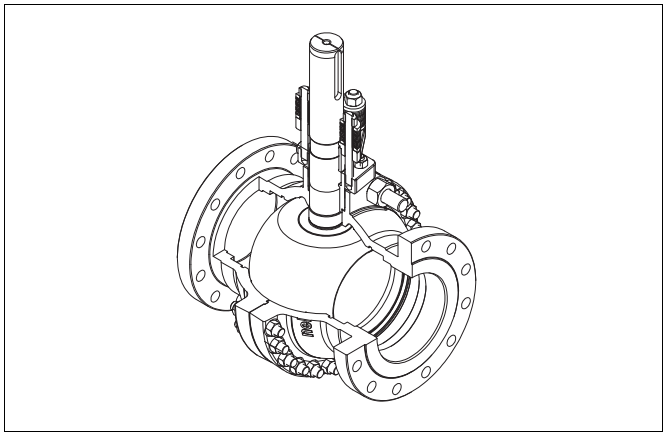


Fig. 1 Construction of the D series valve

1.3 Valve markings

The body markings are cast or stamped on the body side. The identification plate (Figure 2) is attached to the valve flange.

The identification plate has the following markings:

1. Body material
2. Ball material
3. Stem material
4. Seat material
5. Maximum operating temperature
6. Minimum operating temperature
7. Maximum shut-off pressure differential
8. Type code
9. Number of the list of valve manufacturing parts
10. Pressure class

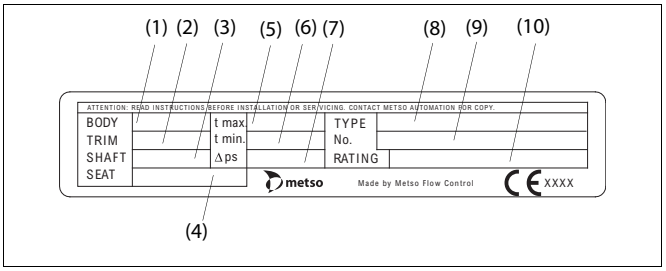


Fig. 2 Identification plate

1.4 Technical specifications

Face-to-face length:	ASME B 16.10, API 6D
Body ratings:	ASME Class 150, 300 and 600
Maximum pressure differential:	see Figures 3 and 4
Temperature range:	see Figures 3 and 4
Flow direction:	single-seated: upstream double-seated: flow direction free
Leakage rate:	
metal-seated	ASME Class V ISO 5208 leakage rate D, C, or B
soft-seated	API-598 (1970)
Dimensions:	see Section 11
Weight:	see Section 11

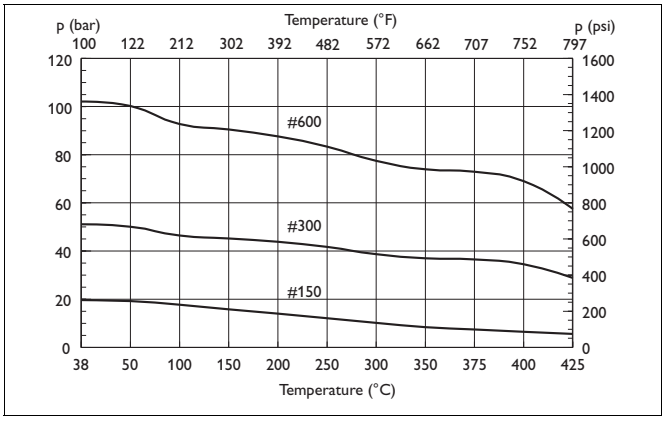


Fig. 3 Pressure/temperature curves of the valve body, material ASTM A216 gr. WCB

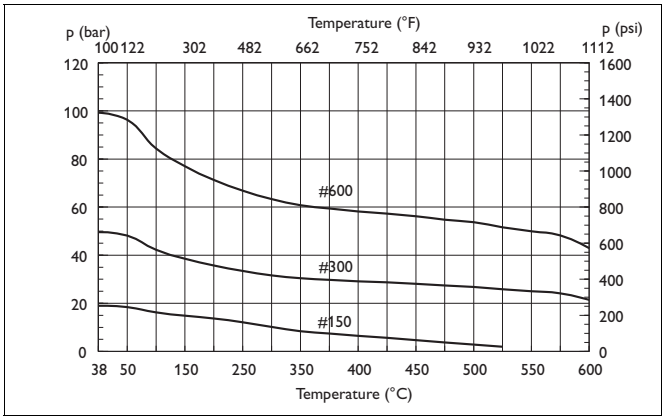


Fig. 4 Pressure/temperature curves of the valve body, material ASTM A351 gr. CF8M

1.5 CE marking

The valve meets the requirements of the European Directive 2014/68/EU relating to pressure equipment, and has been marked according to the Directive.

1.6 Recycling and disposal

Most valve parts can be recycled if sorted according to material.

Most parts have material marking. A material list is supplied with the valve. In addition, separate recycling and disposal instructions are available from the manufacturer.

A valve can also be returned to the manufacturer for recycling and disposal against a fee.

1.7 Safety precautions

CAUTION:
Do not exceed the performance limitations!
Exceeding the performance limitations marked on the valve may result in valve damage or even in uncontrolled pressure release. Damage or personal injury may result.

CAUTION:
Do not remove or dismantle a pressurized valve!
Removing or dismantling a pressurized valve will cause an uncontrolled pressure release. Always shut off the pipeline, release the pressure and remove the medium before removing or dismantling the valve. Identify the medium, protect yourself and the environment against any harmful or poisonous substances. Prevent the medium from entering the pipes during maintenance.
Failure to do this may result in damage or personal injury.

CAUTION:
Beware of the cutting movement of the ball!
Keep hands, other parts of your body, tools and other objects out of the open flow port. Also make sure that no foreign objects enter the pipeline. Close and detach the actuator pressure supply for maintenance.
Failure to do this may result in damage or personal injury.

CAUTION:
Protect yourself against noise!
The valve may produce noise in the pipeline. Its level depends on the application and can measured or calculated using the Metso Nelprof computer program. Occupational safety regulations on noise levels should be observed.

CAUTION:
Beware of extreme temperatures!
The valve body may be very hot or very cold. Protect people against frostbites and burns.

CAUTION:
When handling the valve or the valve package, remember its weight!
Do not lift the valve or the valve package from the actuator, positioner, limit switch or their pipes. When lifting the valve, place the lifting ropes around the valve body. See Figure 5.
Damage or personal injury may result from falling parts.
Valve weights are listed in Section 11.

CAUTION:
Follow the proper procedures when handling and servicing oxygen valves.

2 TRANSPORT, RECEPTION AND STORAGE

Check the valve and the associated equipment for any transport damage.

Before mounting the valve, store it indoors in a suitable place.

Do not take the valve to the intended location or remove the flow port protectors until just before the mounting.

The valve is supplied in an open position.

Do not lift the valve or the valve package from the actuator, positioner, limit switch or their pipes.

When lifting the valve, place the lifting ropes around the valve body. See Figure 5.

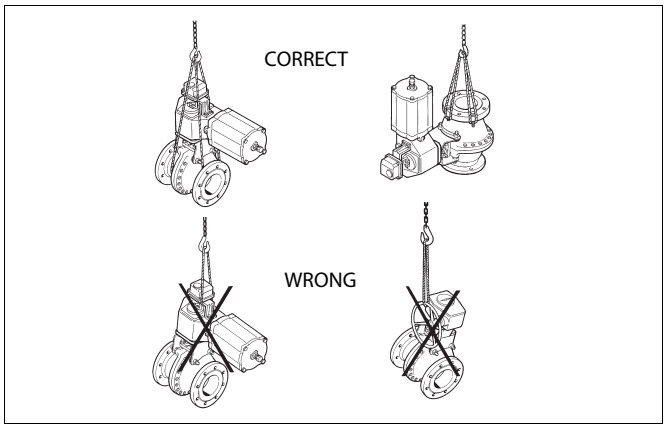


Fig. 5 Lifting the valve package

3 MOUNTING AND COMMISSIONING

3.1 General

Remove the flow port protectors and check the valve for dirt that may have entered it during transportation and storage.

3.2 Mounting the valve in the pipeline

CAUTION:
The valve and valve package are heavy. Remember this when handling them.

Clean the pipes by flushing or blowing before mounting the valve. Keep the valve in fully open position during flushing. Any impurities such as sand or pieces of welding electrode may damage the seats and tightening surfaces of the ball.

NOTE:
Always use the appropriate flange gaskets. Check to see what gaskets are used elsewhere in the pipeline.

NOTE:
Do not try to correct pipeline misalignments with flange bolts.

The functioning of the valve, actuator or the positioner is not affected by the flow direction or the valve position. Do not, however, install the valve with the stem pointing downwards. This may allow impurities at the bottom of the pipeline to enter the space between the stem and the body and damage the gland packing.

Sufficient support for the pipeline reduces stress due to pipeline vibration. Low vibration also ensures reliable positioner operation.

An unsupported valve is easier to maintain. Nevertheless you can support the valve by its body with standard pipe clamps and supports. Do not fasten the supports to the flange bolts or the actuator.

3.2.1 Assembly of welding end valve

The valves are mounted in the pipeline by using standard welding methods.

When welding or annealing the joints, assure that the temperature of body in PTFE or the rubber sealings is not higher than that allowed for this type of sealing material, e.g. 120 °C. The increase of temperature can be prevented by winding wet protection cloth around the body during the welding. Figure 6.

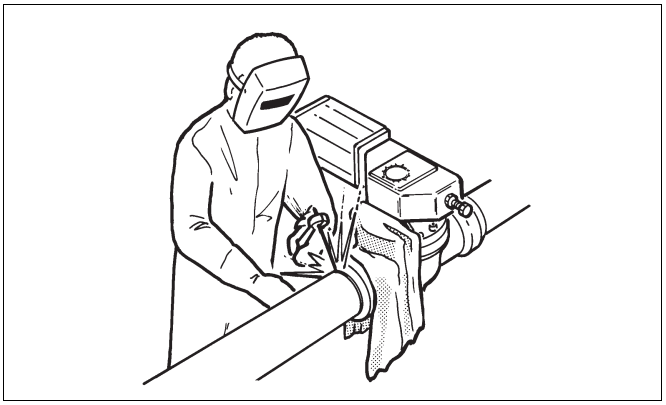


Fig. 6 Valve body covered with wet protection cloth during welding

Valves with welding ends are, if necessary, supported by flaky, arched supports on the machined part or preferably (Figure 7) on the part of pipeline next to the valve.

After welding, the piping should be carefully cleaned and flushed before operating the valve.

After trial operation, the valve should be left in the 'Open' position until the process is started up.

If the valve is found to jam during test operation, open it and flush again with a powerful flow.

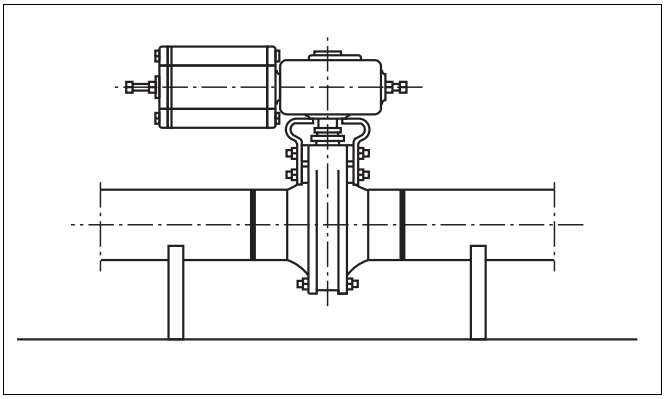


Fig. 7 Supporting the welding end valve

3.2.2 Valve insulation

If necessary, the valve may be insulated. Insulation must not continue above the upper level of the valve body, see Figure 8.

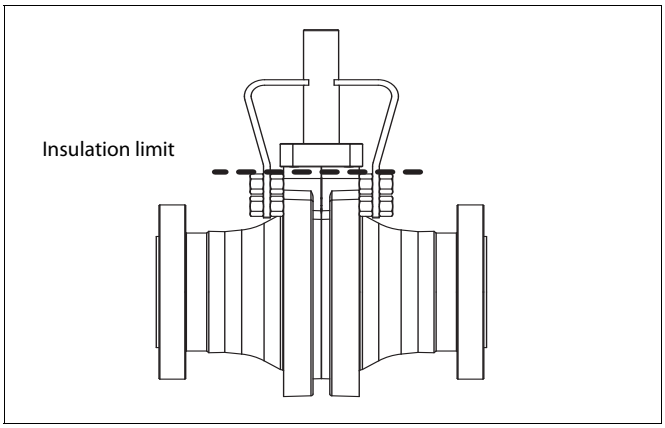


Fig. 8 Insulation of the valve

3.3 Actuator

NOTE:
When mounting the actuator, check that the valve package functions properly. For more information about the mounting of the actuator, see Section 6 or the separate actuator instructions.

The closed position of the ball is indicated as follows:

- ❑ by an indicator on the actuator or
- ❑ by a groove at the end of the ball stem (parallel to the flow opening).

If you are not sure about the indicator, check the flow direction by the groove.

If possible, mount the valve so that it can remain in place even if the actuator is removed.

Mount the actuator cylinder should be mounted in an upright position.

The actuator should not touch the pipeline as pipeline vibration may damage it or affect its performance.

3.4 Commissioning

Before commissioning, check the valve and the pipeline for any impurities or foreign objects. Flush the pipeline carefully and keep the valve in fully open position during the flushing.

Check all joints, pipings and cables.

Check the adjustments of the actuator, positioner and the limit switch. For actuator adjustment, see Section 6. For other devices, consult their individual manuals.

If necessary, tighten the gland packing.

4 MAINTENANCE

4.1 Maintenance general

CAUTION:

Observe the safety precautions mentioned in Section 1.7 before maintenance!

CAUTION:

When handling the valve or the valve package as a whole, bear in mind the weight of the valve or the entire package.

Although Metso's Neles valves are designed to work under severe conditions, proper preventative maintenance can significantly help to prevent unplanned downtime and in real terms reduce the total cost of ownership.

Metso recommends inspecting the valves at least every five (5) years.

The inspection and maintenance interval depends on the actual application and process condition.

The inspection and maintenance intervals can be specified together with your local Metso experts. During this periodic inspection the parts detailed in the Spare Part Set should be replaced. Time in storage should be included in the inspection interval.

Maintenance can be performed as presented below. For maintenance assistance, please contact your local Metso office. The part numbers in the text refer to the exploded view and to the parts list in Section 10, unless otherwise stated.

NOTE:

When sending goods to the manufacturer for repair, do not disassemble them. Clean the valve carefully and flush the valve internals.

For safety reasons, inform the manufacturer of the type of medium used in the valve (include material safety datasheets (MSDS)).

NOTE:

In order to ensure safe and effective operation, always use original spare parts to make sure that the valve functions as intended.

NOTE:

For safety reasons, replace pressure retaining bolting if the threads are damaged, have been heated, stretched or corroded.

NOTE:
A valve sent to the manufacturer for servicing should not be dismantled. Clean the valve carefully from inside and outside and, to ensure safety, inform the manufacturer of the type of medium involved.

4.2 Maintenance of a mounted valve

4.2.1 Gland packing

Replace the gland packing (69) if the tightening of the nuts does not stop leakage.

Ensure that the valve is unpressurized and remove the actuator. Then remove the existing gland packing using a tool that does not damage the tightening surfaces.

Install the new gland packing as instructed in Sections 4.7.4 and 4.7.5.

4.2.2 Body and bonnet joint

Should the body joint leak tighten the nuts as indicated by the torques in Section 4.7.3.

4.2.3 Turning the ball

If the ball's tightening surface is so badly damaged that the valve leaks in closed position, turn the ball 180 degrees. Note the effect of the measure on the orientation of the actuator. Should the leaking continue, send the ball to the manufacturer for repairs.

Do not turn a ball with a Q attenuator. For further instructions, contact the manufacturer.

4.3 Removing the actuator from the valve

CAUTION:
The valve package is heavy. Remember this when handling it.

NOTE:
To ensure proper reassembly, observe the position of the actuator and the positioner/limit switch with respect to the valve before removing the actuator.

It is usually easiest to remove the actuator and its support equipment before removing the valve from the pipeline. If the package is small or not easily accessible, it is better to remove the entire package at one go.

- ❑ Close and detach the actuator pressure supply and remove the control cables and pipes from their couplers.
- ❑ Loosen the bracket screws.
- ❑ Remove the actuator from the valve with an extractorthat can be ordered from the manufacturer (See Chapter 'Tools'). See Figure 9.
- ❑ Remove the bracket and any coupling.

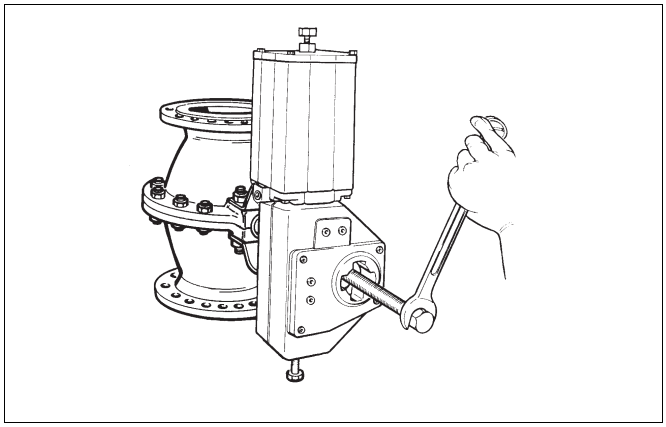


Fig. 9 Removing the actuator with the extractor

4.4 Removing the valve from the pipeline

CAUTION:
Do not remove or dismantle a pressurized valve!

- ❑ Make sure that the pipeline is empty and unpressurized and that there is no medium flowing into the pipeline while the valve is not in its normal position.
- ❑ Carefully attach the ropes, loosen the pipe flange screws and lift the valve using the ropes. Make sure that you lift the valve correctly. See also Figure 5.

4.5 Dismantling the valve

- ❑ Place the valve on its flange on a clean, level surface made of wood, hardboard or plastic. If necessary, support the actuator so that it cannot overturn as the mounting bolts are being removed.
- ❑ Remove the actuator if it is still attached to the valve.
- ❑ Remove the mounting brackets of the valve.
- ❑ Tap loose the key at the end of the ball stem.
- ❑ Remove any burrs from the keyway edges.
- ❑ Loosen the gland packing nuts and the bonnet's fastening bolts and pull the bonnet away from the ball stem.
- ❑ Remove the bolts keeping the body halves together and lift the upper body half on its flange.

4.6 Removing and inspecting the valve parts

4.6.1 Ball

To make carrying and inspection easier, the balls >DN300 (12") have a threaded hole at the end of the stem for an eyebolt.

- ❑ Lift the ball from the body on a soft surface and clean it.
- ❑ Check the sealing and bearing surfaces of the ball stem.
- ❑ Remove any minor scratches and impurities using an emery cloth.
- ❑ File off any burrs from the stem keyway.
- ❑ If the ball has deep scratches on its sealing and bearing surfaces or if it is not fully spherical, it should be sent to the manufacturer for repairs.

4.6.2 Bearings

- ❑ Check the bearings. In PTFE bearings, the stainless steel net should not be visible.

4.6.3 Seats

- ❑ Turn the body upside down and detach the seat by tapping at it through the flow opening with a rubber or plastic mallet.
- ❑ Clean and check the tightening surfaces.

4.6.4 Body and bonnet

- ❑ Always replace the body and bonnet gaskets during maintenance.
- ❑ Remove existing gaskets from all sealing surfaces and clean the surfaces carefully.

- ❑ Do not round the sharp edges at the convergence point of the body joint and bonnet sealing surfaces, as this could cause leaks. See Figure 10.
- ❑ Remove the gasket from the bonnet, for example with a screwdriver.

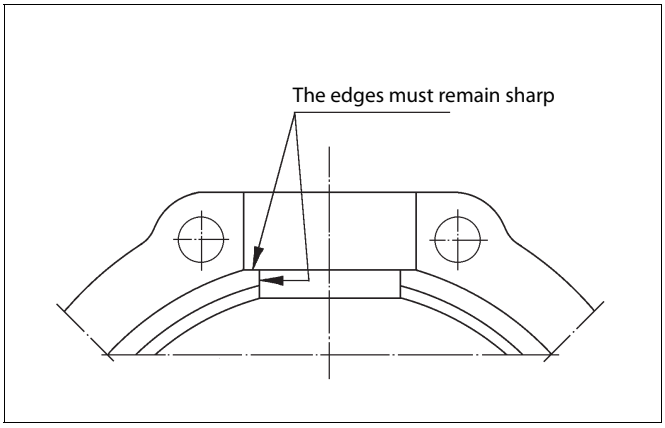


Fig. 10 Sealing surfaces

4.6.5 Other parts

- ❑ Clean all parts carefully, including the studs and nuts.
- ❑ After cleaning and checking all parts, keep them in a protected place until reassembly. Handle the ball, its seats and the body joint surfaces with particular care.
- ❑ If necessary, send the valve to the manufacturer for repairs.

4.7 Reassembling the valve

- ❑ Reassemble the valve by placing the female body half on a level surface in an upright position with the body joint pointing upwards.
- ❑ Then put the parts in their place in the following order:

1. Seats
2. Ball with its bearings
3. Body joint between body halves and bonnet
4. Gland packing

4.7.1 Fitting the seats

T and S seats

- ❑ Check and clean all components before starting the seat assembly
- ❑ Place the back seals (63) into their position to the body grooves. See Figure 11.
- ❑ Place the back-up rings (64) made of PTFE strips at the side of the O-ring. To ensure that the seam becomes flexible, the strip must have slanted ends.
- ❑ For easier assembly, lubricate the O-ring and back-up ring surfaces facing the seats with silicone grease or another suitable substance.
- ❑ Place the spring (62) into the groove in the seat (7). Connect the ends of the spring.
- ❑ Place the seats into the body by hand or if necessary, using a plastic mallet. The seat is in correct position when the spring touches the body shoulder.

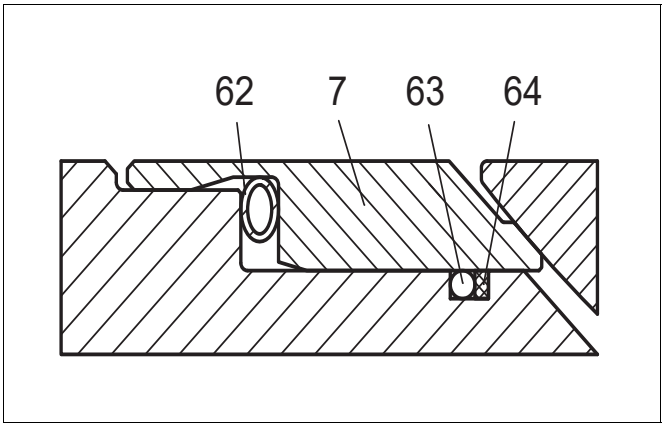


Fig. 11 T and S seats

D and R seats

- ❑ Check and clean all components before starting the seat assembly.
- ❑ Place the spring (62) into the body cavity and connect the ends of the spring.
- ❑ Place the set ring (130) against the spring (62).
- ❑ Place the graphite backseal (129) carefully against set ring (130).
- ❑ Make sure the back seal (129) is installed in correct direction.
- ❑ Place the O-ring (63) into the body groove.
- ❑ Place the back-up rings (64) made of PTFE strips at the side of the O-ring. Ensure that the seam becomes flexible, the strip must have slanted ends.
- ❑ For easier assembly, lubricate the O-ring (63) and back-up ring (64) with silicone grease or another suitable substance.
- ❑ Place the seat (7) into the body cavity by hand or if necessary, using a plastic mallet. The seat (7) is in correct position when the backseal (129) touches the seat shoulder (7).

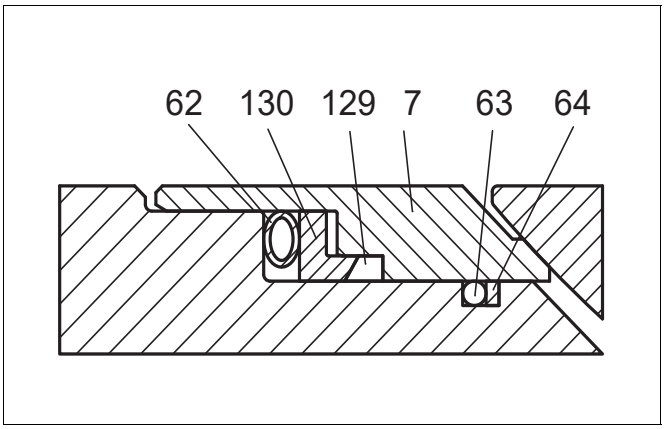


Fig. 12 D and R seats

E seats

- ❑ Check and clean all components before starting the seat assembly.
- ❑ Place the back seals (63, 75) into their place in the body grooves. See Figure 13.
- ❑ Place the back-up rings (64, 76) made of PTFE strips on both sides of the back seal (63) and beside the back seal (75). To ensure that the seam becomes flexible, the strips must have slanted ends.
- ❑ For easier assembly, lubricate the O-ring and back-up ring surfaces facing the seats with silicone grease or another suitable substance.
- ❑ Place the spring (62) into the groove in the seat (7). Connect the ends of the spring.
- ❑ Place the seats into the body by hand and make sure that the pin (78) in the body, which prevents the seat from rotating, goes into the hole in the seat. Note that the bore through the seat is an ejector hole. If necessary, use a plastic mallet.
- ❑ The seat is in the correct position when the spring touches the body shoulder.

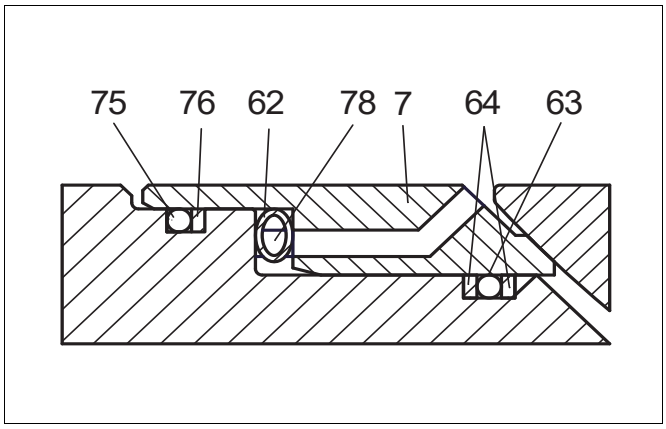


Fig. 13 E seat

H seats

- ❑ Check and clean all components before starting the seat assembly.
- ❑ Lap the opposing surfaces of the seat and bellows and of the bellows and body with diamond paste before you fit the seat.
- ❑ Then clean the parts carefully using a suitable solvent and emery paper (500 or finer).
- ❑ Place the seat into the body.

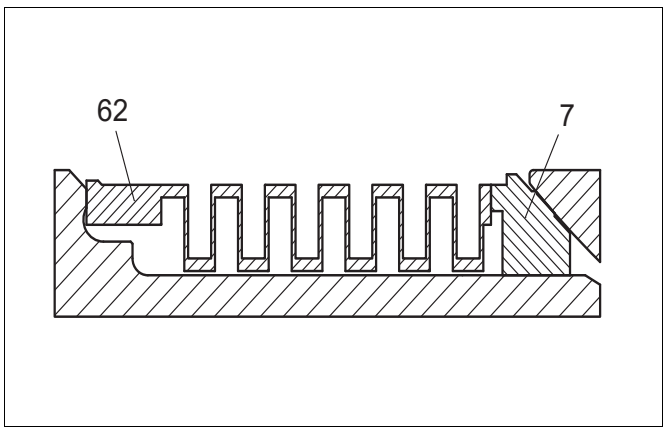


Fig. 14 H seat

C seats

- ❑ Check and clean all components before starting the seat assembly.
- ❑ Place graphite backseal (129) carefully into the seat. Make sure the backseal is installed in correct direction.
- ❑ Make sure there are not any sharp edges in the seat cavity of valve body to damage the backseal.
- ❑ Place the seat into the body.

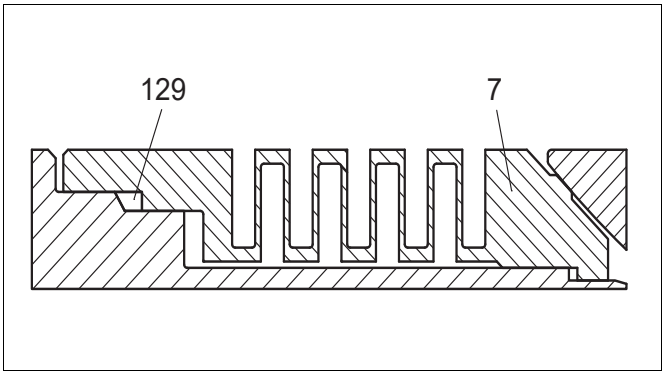


Fig. 15 C seats

4.7.2 Bearings and ball

PTFE bearings

- ❑ Place the bearings (60,61) onto the thrust and trunnion bearings so that the PTFE surface touches the stem. See Figure 17.
- ❑ Push the bearing (60) into the thrust bearing (4).
- ❑ Turn the bearing (61) so that it fits inside the trunnion bearing (5). Push the bearing until the lip is flush with the flange groove. Then release the bearing and push the lip into the groove.
- ❑ When you install the thrust bearing (89), make sure that the PTFE surface is against the ball shoulder.
- ❑ Push the bearings onto the stem and the trunnion.

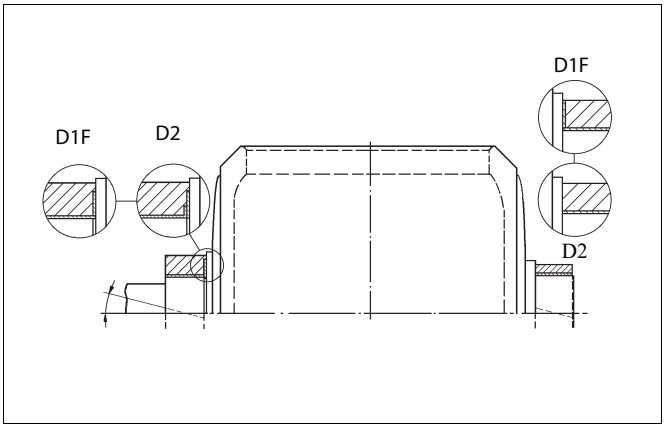


Fig. 16 PTFE bearings

Heat-resisting bearings

High-tolerance cobolt alloy bushings are used as bearings.

- ❑ Place the bearing (4) onto the stem so that the shoulder faces the ball.
- ❑ Place the trunnion bearing (5) in its place.

Ball

- ❑ Lower the ball (3) carefully to the female body half (2). The bearings will ensure that the ball goes into the correct position inside the body half.

4.7.3 Body Joint

Depending on the valve application, the body joint gasket (65) is of either PTFE or graphite.

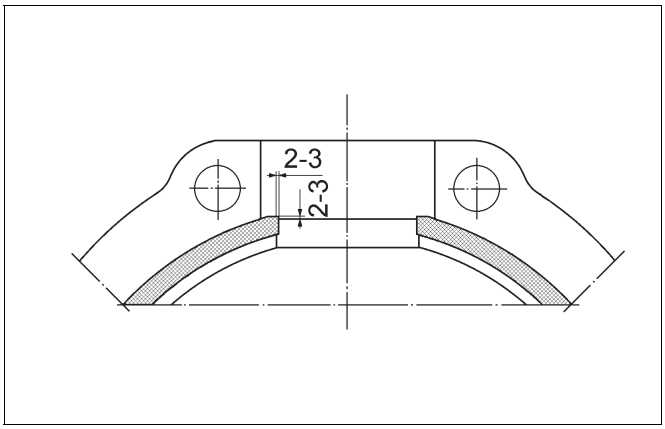


Fig. 17 Fitting and cutting the graphite gasket

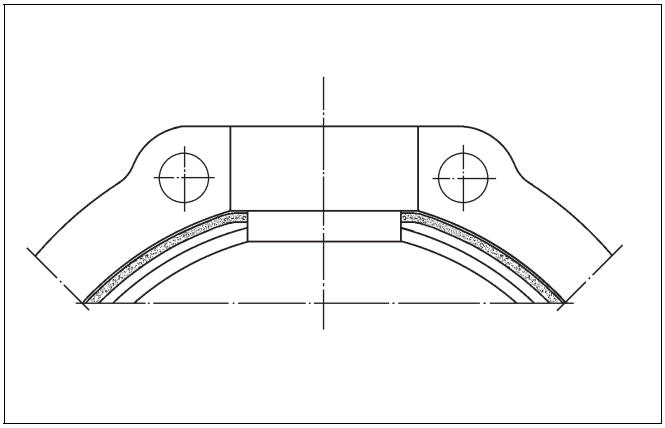


Fig. 18 Fitting the PTFE gasket strip

❑ Place the PTFE gasket into the outer circumference of the groove of the female body half. See Figure 19.

Tightening the body joint bolts

❑ After fitting the ball and the body gasket, lift the male body half (1) and the seat (7) onto the ball. See Section 4.7.1.

❑ Check the correct alignment of the bonnet bore with the body joint. Push the bonnet (8) onto the stem.

❑ Lubricate the flange, neck and bonnet bolts and screw them into position. If hexagon bolts are used as flange bolts, it is easier to tighten them if they are inserted from below so that the nuts can be tightened from above the body joint flange.

❑ Put the bonnet (8) into its place. After tightening the flange bolts loosen the bonnet bolts and remove the bonnet.

❑ Tighten the flange bolts as indicated in Figure 20. Start from opposite the stem and first tighten the bolts to torques that are 10 % of the values in Table 1. Then tighten them to their final torques in the same sequence.

❑ In valves up to DN 100 mm (4"), insert the neck bolts before mounting the body halves. Center them so that the distance from the nut's outer side to the bolt's shoulder is equal at both ends. Tighten the neck bolts after tightening the flange bolts.

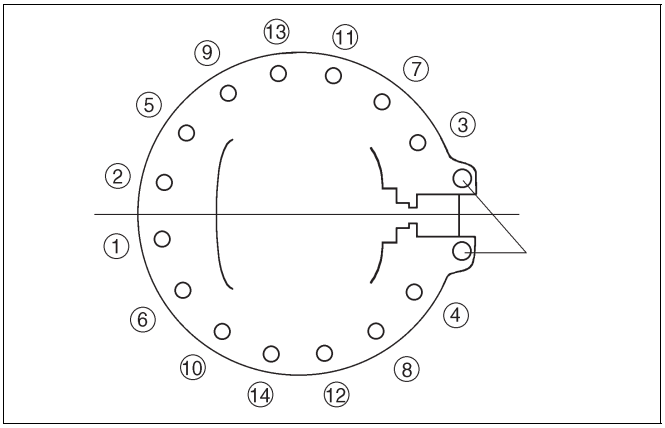


Fig. 19 Tightening the body joint bolts

Tightening the bonnet bolts

❑ Remove any excessive body gasket from the gland surface, for example with a screwdriver.

❑ Place the ring-shaped bonnet gasket (66) into the bonnet shoulder. You can attach the gasket to the bonnet for the duration of the installation with small amounts of silicon grease.

❑ Place the bonnet onto the stem.

❑ Tighten the bonnet bolts as indicated by the torques in Table 1.

4.7.4 Gland packing, D2, D1F

❑ Install the new gaskets one by one by using the gland. PTFE rings should be mounted so that the breaks are at a 45 angle with respect to the flow opening and at a 90 angle with respect to each other. Graphite rings should be put into place from the end of the stem. Make sure that there is no burrs in the keyway, as it could damage the gland packing.

❑ Put the gland into place.

❑ Turn the hexagon nuts on the studs and tighten the gland packings while the valve is still unpressurized.

❑ Re-tighten the nuts as needed.

Table 1 Tightening torques

Thread	Torque, Nm
5/16 UNC	25
3/8 UNC	45
1/2 UNC	100
5/8 UNC	200
3/4 UNC	350
7/8 UNC	500
1 UNC	700
1 1/4 8UN	1300
1 1/2 8UN	1600
1 3/4 8UN	1600
2 8UN	2500
2 1/4 8UN	3500
2 1/2 8UN	5000
2 3/4 8UN	6300
3 8UN	8400

NOTE: Tightening torques are for guideline only.
Consult with valve manufacturer.

4.7.5 Gland packing, D1F_G, D2_G

- ❑ Make sure the valve is not pressurized.
- ❑ Unfasten the nuts (18) and remove the disc spring (TA-Luft) kits (150), the gland (9a), the retainer ring (42) and the compression ring (9b).
- ❑ Remove old packing rings (20). Do not damage the surfaces of the packing ring counterbore and shaft.
- ❑ Clean the gland and packing ring counterbore. Install new set of packings. Slip the rings onto the shaft. Ensure that there are no burrs in the keyway groove which could damage the packing. Position the cut ends of the graphite rings at a 90° angle to each other.
- ❑ Mount the compression ring.
- ❑ Slip the retainer ring (42) on the shaft and push it against the compression ring, see Figure 21. See also the caution.
- ❑ Install the gland.

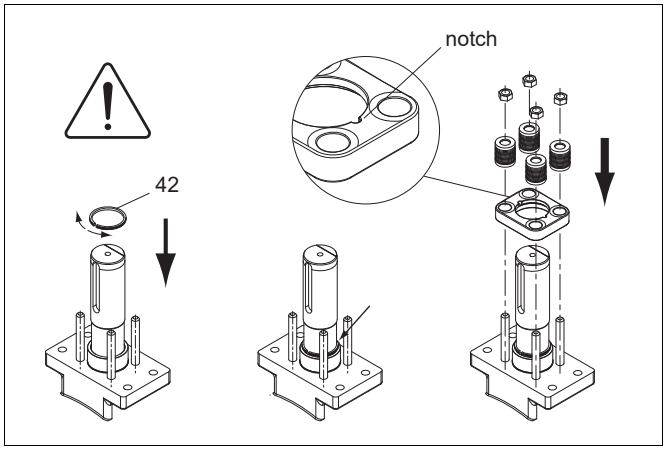


Fig. 20. Mounting the retainer ring

- ❑ Pre-compress the packing rings first either by tightening the gland nuts (with or without disc springs) to the torque T_t or by tightening the gland with disc springs to the height H_2. See Fig. 22 and the value from Table 2.
- ❑ Carry out 3…5 operation cycles with the valve. Suitable range of movement is about 80 %.
  It is not necessary to fully close or open the valve during the operation.
- ❑ Loosen the gland nuts. Place the disc spring sets (150) on the gland studs as applicable. Retighten the nuts (18) to the torque T_t or so that the disc springs are compressed to the height H_2, see Table 2.
- ❑ Check leakage when the valve is pressurized.

CAUTION:
Before pressurizing the valve, check through a notch in the gland that the retainer ring (42) is installed in place.

- ❑ If the leakage still occurs when the valve is pressurized, re-tighten the nuts but don't exceed the value in the Table 2 by 50 % or do not fully compress the disc springs.

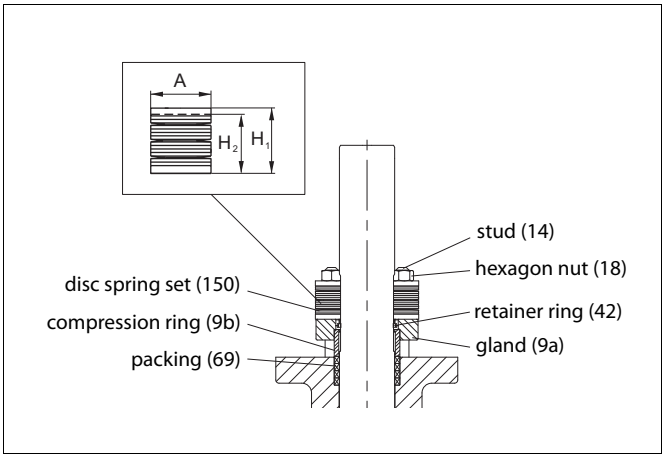


Fig. 21. Gland packing, D1F_G, D2_G

Table 2 Tightening of gland packing, D1F_G, D2_G

Valve size			Shaft	Spring dimensions (free)		PTFE		Graphite	
D2C_G	D2D_G	D1F_G	Shaft Dia			Disc spring	Nut	Disc spring	Nut
NPS			mm	A, mm	H1, mm	H2 ,mm	Tt, Nm	H2 ,mm	Tt, Nm
		02	25	25	30.5	29.8	3.5	27.9	13.4
		03	35	31.5	35.2	34.4	4.6	32.0	17.5
	04	04	40	35.5	41	40.2	5.1	37.0	19.6
	06	06	55	40	45.5	44.3	14.4	40.8	54.7
	08	08	70	50	59	58.0	23.9	55.1	91.0
10	10	10	85	50	59	57.8	28.6	54.4	108.5
12 -18	12, 18	12	95	71	73	71.4	33.4	66.9	127.0
20	14, 20	14	105	56	59	57.0	43.4	51.1	164.9
24	16, 24	16	120	71	73	71.0	56.8	65.4	215.8
28	28	18	135	80	90.3	88.9	63.3	84.8	240.6
30	30, 32	20	150	80	90.3	87.9	104.2	81.3	396.1
36	36	24	165	80	90.3	88.6	75.8	83.7	288.0
		28	190	80	90.3	88.3	86.2	82.8	327.7

5 TESTING THE VALVE

CAUTION:
When you do pressure testing, use equipment conforming to the correct pressure class!

Body tightness should be tested after valve reassembly by applying a sufficiently high water pressure.

Pressure should be tested in accordance with an applicable standard. Use the pressure required by the pressure class or the flange bore. The valve should be in the intermediate position during the test.

If the tightness of the closure member shall also be tested, contact the manufacturer.

6 MOUNTING THE ACTUATOR

6.1 General

Different Metso actuators can be mounted on the valves with suitable mounting parts and couplings. Valves can be operated with M manual actuator and B1 series actuators, for example.

6.2 M actuator

- ❑ File off any burrs and clean the stem bore.
- ❑ Place the coupling over the stem. Note the correct position. The line at the end of the stem and coupling indicates the direction of the ball flow bore.
- ❑ Lubricate the coupling and the stem bore. Fasten the bracket loosely to the valve.
- ❑ Slip the actuator carefully onto the coupling. Avoid forcing it, since this may damage the ball and seats.
- ❑ Lubricate actuator mounting screws and then fasten all screws.
- ❑ Adjust the ball open and closed positions by means of the stop screws located at the side of the housing (see Figure 22). The closed position screw is nearest to the handwheel on the side of the housing, and the open position screw is on the opposite end. The turning directions are marked on the wheel.
- ❑ Ensure correct functioning of the actuator. Turn it to both open and closed positions. The yellow arrow should indicate the direction of the ball flow bore.

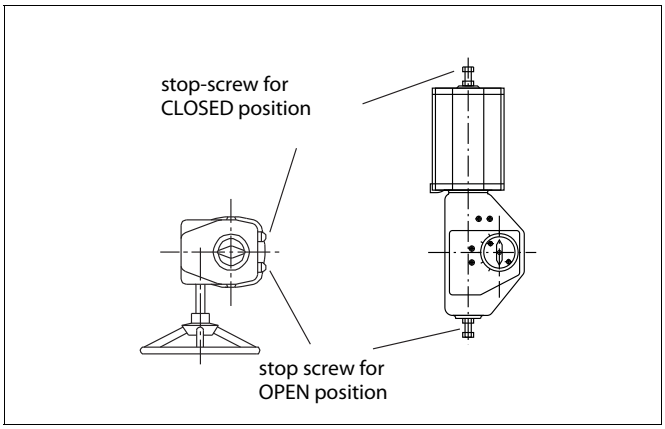


Fig. 22 Open and closed positions of the valve

6.3 B1C actuator

CAUTION:
Beware the cutting movement of the ball!

- ❑ Drive the actuator piston to the extreme end of the cylinder and turn the valve to closed position.
- ❑ Clean the actuator stem bore and remove any burrs.
- ❑ Insert the coupling into the stem bore, if necessary. Note the correct position of the actuator stem. A line at the end of the shaft and the coupling indicate the direction of the ball flow bore.
- ❑ Lubricate the coupling and the stem bore and place the brackets on the valve.
- ❑ Carefully push the actuator onto the shaft. Excessive force may damage the ball and the seat. If possible, mount the actuator is mounted with the cylinder pointing upwards.
- ❑ Place the actuator as straight as possible relative to the valve. Lubricate the fastening bolts, install the washers and tighten them and all screws.
- ❑ Adjust the open and closed positions of the ball with the adjustment screws in the actuator. See Figure 22. The exact open position is indicated by the flow bore. The yellow arrow should indicate the direction of the flow bore. **Do not put your fingers into the flow bore!**

No adjustments are needed if the actuator has been mounted on the same valve previously. You only need to move the actuatortothe open position,turn it so that the valve is also fully open and install the actuator.

- ❑ In cylinder applications, check the tightness of the adjustment screw at the cylinder end. An O-ring is used for sealing.
- ❑ Check the proper functioning of the actuator. Check the direction of the ball flow bore and the direction of the actuator with respect to the valve (clockwise closed, counter-clockwise open) after you have mounted the actuator. When the piston is at the extreme end of the cylinder, the valve should be in the closed position.
- ❑ Check that the yellow arrow indicates the direction of the flow bore. Correct the arrow direction if necessary.

6.4 B1J actuator

Spring return actuators are used when the valve should either open or close when the air supply is running out. The B1J is used for the function 'spring closes', in which the spring is on the side of the piston stem and pushes the piston towards the outer end of the cylinder. B1JA is used for the function 'spring opens', in which the spring is between the piston and the cylinder end on the other side than the piston rod.

Install spring return actuators in the same way as B1C actuators. However the following should be taken into account.

6.4.1 B1J type

Install the actuator so that the piston is at the outermost end of the cylinder. The cylinder should be unpressurized and supplied with air. The valve should be in the closed position.

6.4.2 B1JA type

Install the actuator so that the piston is at the side of the housing. The cylinder should be unpressurized and supplied with air. The valve should be in the open position.

Otherwise the instructions for B1C apply (Section 6.3).

6.5 Mounting actuators of other manufacturers

NOTE:
Metso only accepts responsibility for the actuators of other manufacturers which it has installed.

Actuators of other manufacturers can only be installed if they have an ISO 5211 actuator connection.

7 MALFUNCTIONS

Operational malfunctions are listed in Table 3.

Table 3 Malfunctions

Symptom	Possible reason	Action
Leakage through a closed valve	Wrong stop screw adjustment of the actuator	Adjust the stop screw for closed position
	Damaged ball tightening surface	Turn the ball by 180 degrees
	Damaged seat(s)	Replace seat(s)
	Ball cannot move freely	Clean the valve from inside
Irregular valve movement	Dirt between the ball and the seats	Flush the valve from the inside
		Clean the tightening surfaces and seats mechanically
Leakage through gland packing	Loose gland packing	Tighten the nuts
	Worn-out or damaged gland packing	Replace the gland packing

8 TOOLS

In addition to standard tools, you might need an extractor for removing the actuator, which can be ordered from the manufacturer. The actuator size and type or tool ID-code (in actuator's IMO) should be given when ordering the tool.

9 ORDERING SPARE PARTS

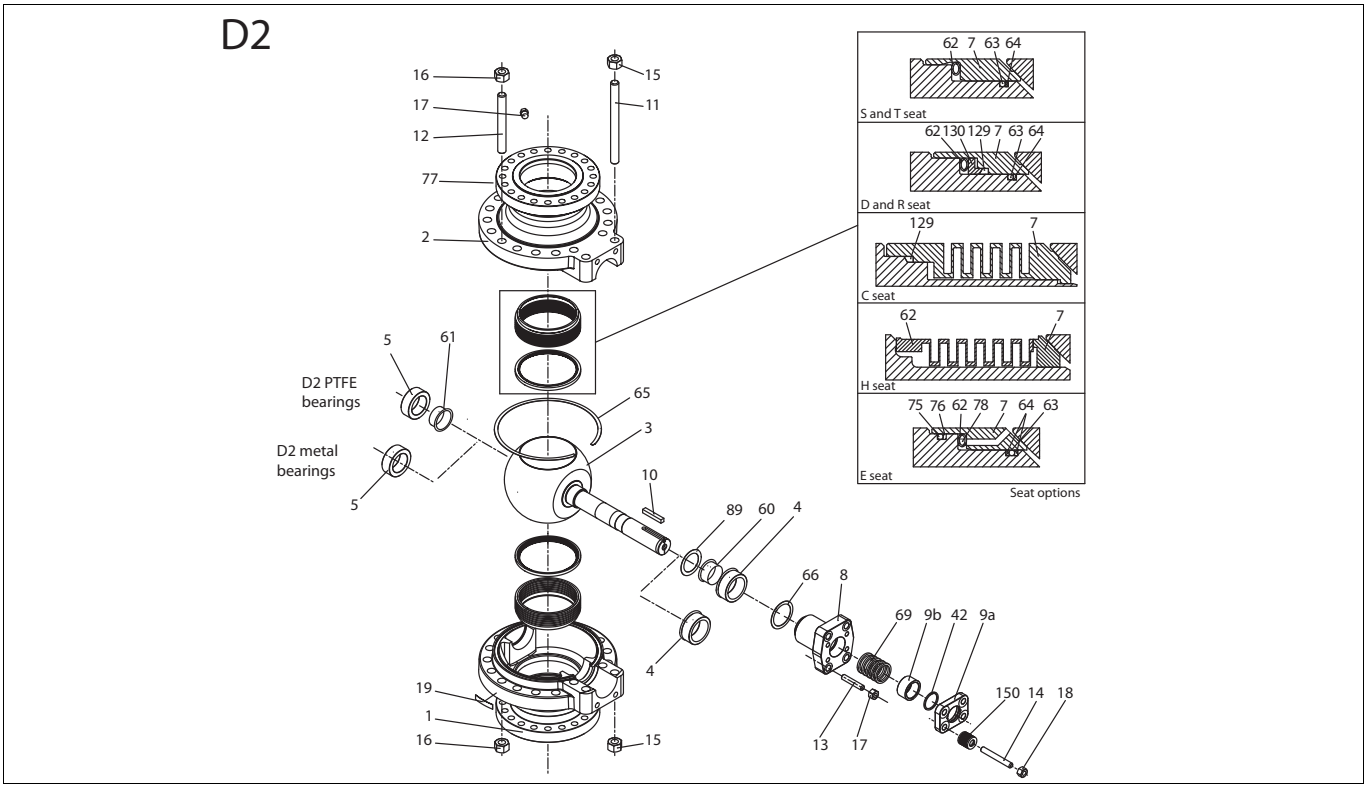
When ordering spare parts, always include the following information:

- ❑ type code, sales order number, serial number (stamped on a valve body)
- ❑ number of the parts list, part number, name of the part and quantity required

This information can be found from the identification plate or documents.

10 EXPLODED VIEWS AND LISTS OF PARTS

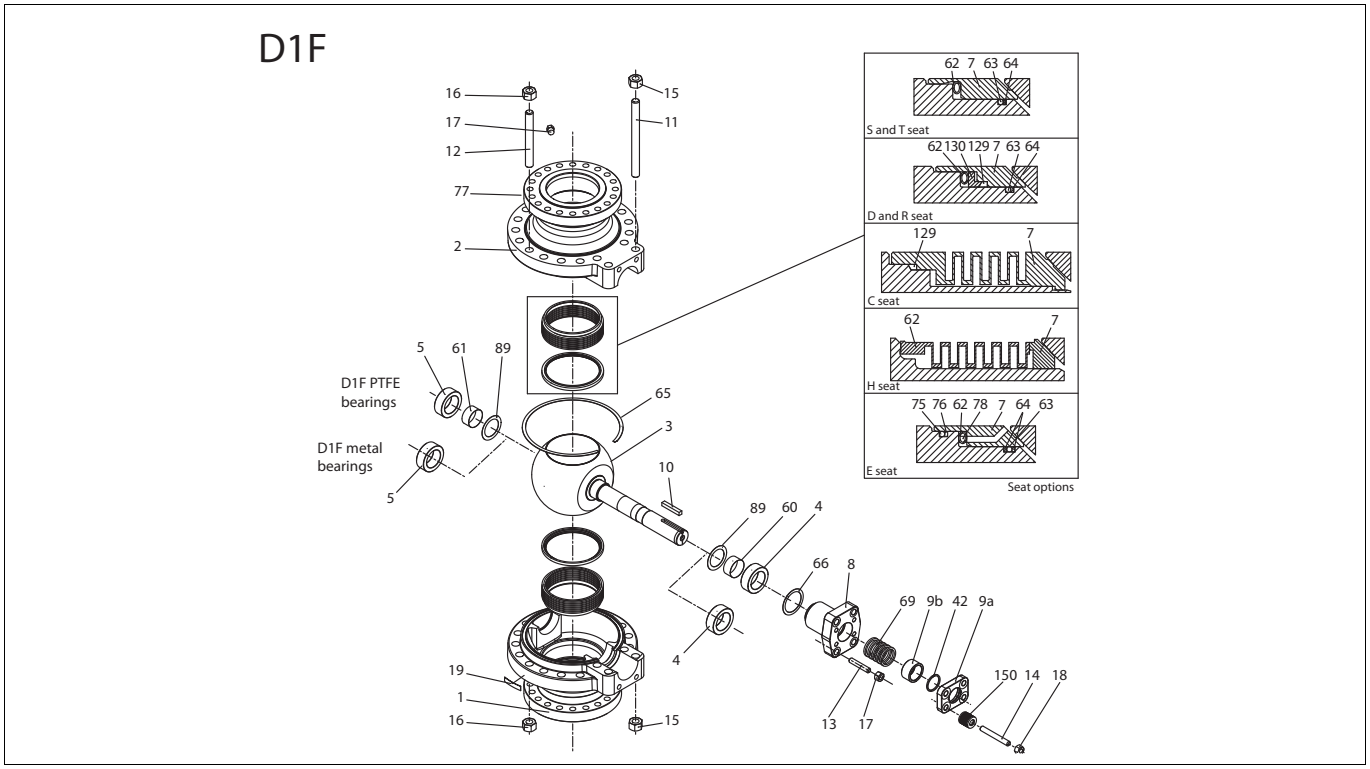
10.1 D2 valves



Part	Qty	Description	Spare part category
1	1	Body half, female	
2	1	Body half, male	
3	1	Ball	3
4	1	Trunnion bearing	3
5	1	Trunnion bearing	3
7	2	Ball seat	2
8	1	Bonnet	
9a	1	Gland	
9b	1	Compression sleeve	
10	1	Key	3
11		Stud	
12		Stud	
13		Stud	
14		Stud	
15		Hexagon nut	
16		Hexagon nut	
17		Hexagon nut	
18		Hexagon nut	
19	1	Identification plate	
42	1	Retainer ring	
60 *	1	Bearing strip	1
61 *	1	Bearing strip	1
62	2	Spring	1
63	2	O-ring	1
64	2	Back-up ring	1
65	2	Seal strip	1
66	1	Sheet ring	1
69		Packing ring	1
75	1	O-ring	
76	1	Back-up ring	
77	1	Hexagon plug	
78	1	Spring pin	
89 *	1	Thrust bearing	1
129	1	Back seal	1
130	1	Set ring	
150	4	Disc spring set	

Spare part (spare part set) category 1: Recommended soft parts, always needed for the repair. Delivered as a set.
Spare part category 2: Parts for replacing of the seat. Available also as a set.
Spare part category 3: Parts for replacing of the closing element.
Spares for the full overhaul: All parts from the categories 1, 2 and 3.
Note: * Only in PTFE bearing construction.

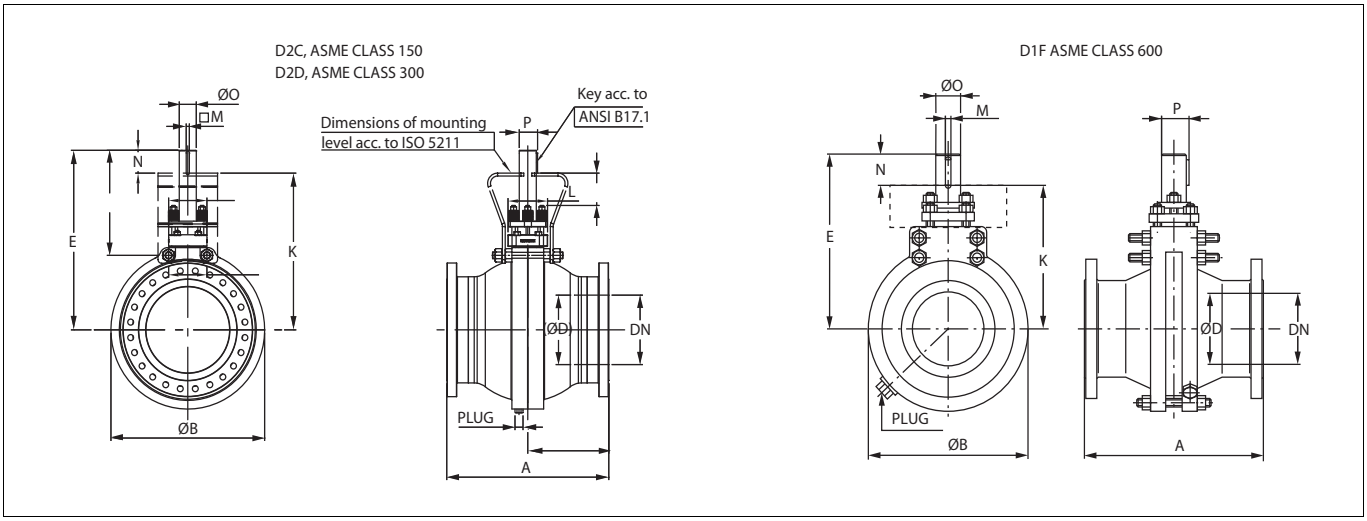
10.2 D1F valves



Part	Qty	Description	Spare part category
1	1	Body half, female	
2	1	Body half, male	
3	1	Ball	3
4	1	Trunnion bearing	3
5	1	Trunnion bearing	3
7	2	Ball seat	2
8	1	Bonnet	
9a	1	Gland	
9b	1	Compression sleeve	
10	1	Key	3
11		Stud	
12		Stud	
13		Stud	
14		Stud	
15		Hexagon nut	
16		Hexagon nut	
17		Hexagon nut	
18		Hexagon nut	
19	1	Identification plate	
42	1	Retainer ring	
60 *	1	Bearing strip	1
61 *	1	Bearing strip	1
62	2	Spring	1
63	2	O-ring	1
64	2	Back-up ring	1
65	2	Seal strip	1
66	1	Sheet ring	1
69		Packing ring	1
75	1	O-ring	
76	1	Back-up ring	
77	1	Hexagon plug	
78	1	Spring pin	
89 *	2	Thrust bearing	1
129	1	Back seal	1
130	1	Set ring	
150	4	Disc spring set	

Spare part (spare part set) category 1: Recommended soft parts, always needed for the repair. Delivered as a set.
Spare part category 2: Parts for replacing of the seat. Available also as a set.
Spare part category 3: Parts for replacing of the closing element.
Spares for the full overhaul: All parts from the categories 1, 2 and 3.
Note: * Only in PTFE bearing construction.

11 DIMENSIONS AND WEIGHTS



D2C, ASME CLASS 150

Type	Dimensions, mm										Mounting face	Plug NPTF	kg
	DN	A	ØB	ØD	E	K	M	N	ØO	P			
D2C 12	300	610	596	304	756	600	22.22	156	95	104.8	F16, F25, F30	1	420
D2C 14	350	686	668	337	818	662	22.22	156	95/105	104.8	F16, F25, F30	1	550
D2C 16	400	762	744	387	840	684	22.22	156	95/120	104.8	F16, F25, F30	1	720
D2C 18	450	864	814	440	890	734	22.22	156	95/120	104.8	F16, F25, F30	1	1300
D2C 20	500	914	904	490	969	789	25.40	180	95/105	116.1	F16, F25, F30, F35	1	1500
D2C 24	600	1067	1084	590	1128	923	31.75	205	95/120	133.8	F25, F30, F35, F40	1	2300
D2C 28	700	1244	1245	692	1263	1038	31.75	225	105/135	149	F30, F35, F40	1	3800
D2C 30	750	1295	1318	740	1485	1235	38.10	250	150	166.6	F30, F35, F40	1	4400
D2C 36	900	1524	1560	880	1661	1381	38.10	280	165	181.8	F40, F48	1	6500

Type	Dimensions, inch										Mounting face	Plug NPTF	lb
	Size	A	ØB	ØD	E	K	M	N	ØO	P			
D2C 12	12	24.02	23.46	11.97	29.76	23.62	0.87	6.14	3.74	4.13	F16, F25, F30	1	924
D2C 14	14	27.01	26.30	13.27	32.20	26.06	0.87	6.14	3.74/4.13	4.13	F16, F25, F30	1	1210
D2C 16	16	30.00	29.29	15.24	33.07	26.93	0.87	6.14	3.74/4.72	4.13	F16, F25, F30	1	1584
D2C 18	18	34.02	32.05	17.32	35.04	28.90	0.87	6.14	3.74/4.72	4.13	F16, F25, F30	1	2860
D2C 20	20	35.98	35.59	19.29	38.15	31.06	1.00	7.09	3.74/4.13	4.57	F16, F25, F30, F35	1	3300
D2C 24	24	42.01	42.68	23.23	44.41	36.34	1.25	8.07	3.74/4.72	5.27	F25, F30, F35, F40	1	5060
D2C 28	28	48.98	49.02	27.24	49.72	40.87	1.25	8.86	4.13/5.31	5.87	F30, F35, F40	1	8360
D2C 30	30	50.98	51.89	29.13	58.46	48.62	1.50	9.84	5.91	6.56	F30, F35, F40	1	9680
D2C 36	36	60.00	61.42	34.65	65.39	54.37	1.50	11.02	6.50	7.16	F40, F48	1	14300

D2D, ASME CLASS 300

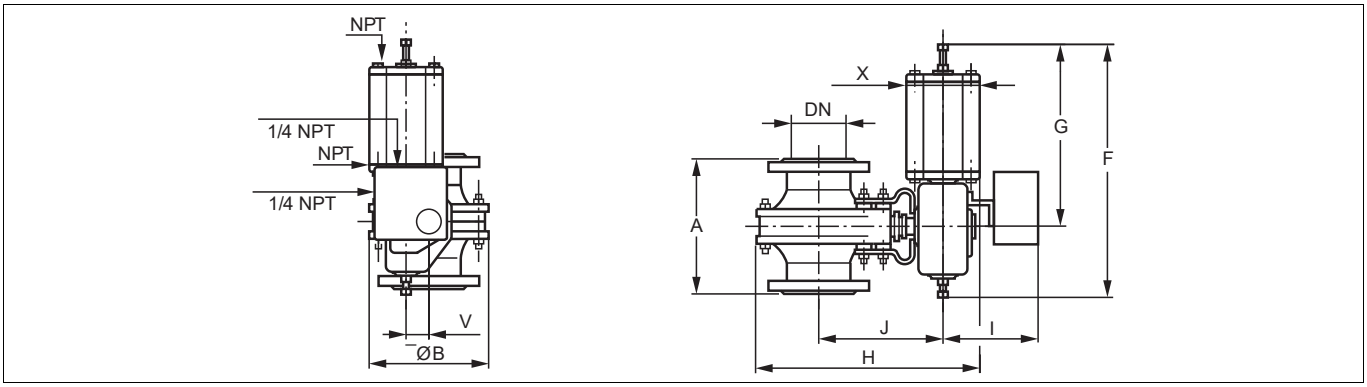
Type	Dimensions, mm										Mounting face	Plug	kg
	DN	A	ØB	ØD	E	K	M	N	ØO	P		NPTF	
D2D 04	100	305	262	100	373	305	9.52	68	40	44.2	F10, F12, F14	1/2	60
D2D 06	150	403	368	152	480	390	12.70	90	55	60.6	F12, F14, F16	3/4	140
D2D 08	200	502	454	202	575	456	19.05	119	70	78.2	F14, F16, F25	3/4	240
D2D 10	250	568	558	254	684.5	538.5	22.22	146	85	94.6	F16, F25, F30	1	380
D2D 12	300	648	630	304	756	600	22.22	156	95	104.8	F16, F25, F30, F35	1	590
D2D 14	350	762	706	337	818	638	25.40	180	105	116.2	F25, F30, F35	1	770
D2D 16	400	838	792	387	910.5	705.5	31.75	205	120	133.8	F25, F30, F35	1	1050
D2D 18	450	914	884	440	1005	849	22.22	156	95	104.8	F25, F30, F35	1	1250
D2D 20	500	991	966	490	1085	905	25.40	180	105	116.2	F25, F30, F35, F40	1	1950
D2D 24	600	1143	1130	590	1229	1024	31.75	205	120	133.8	F30, F35, F40	1	3100
D2D 28	700	1346	1340	690	1323	1098	31.75	225	135	149	F35, F40	1	5250
D2D 30	750	1397	1414	740	1485	1235	38.10	250	150	166.6	F35, F40, F48	1	5500
D2D 32	800	1524	1490	785	1521	1271	38.10	250	150	166.6	F35, F40	1	6700
D2D 36	900	1727	1684	880	1720	1440	38.10	280	165	181.8	F40, F48	1	8700

Type	Dimensions, inch										Mounting face	Plug	lb
	Size	A	ØB	ØD	E	K	M	N	ØO	P		NPTF	
D2D 4	4	12.01	10.31	3.94	14.69	12.01	0.37	2.68	1.57	1.74	F10, F12, F14	1/2	132
D2D 6	6	15.87	14.49	5.98	18.90	15.35	0.50	3.54	2.17	2.39	F12, F14, F16	3/4	308
D2D 8	8	19.76	17.87	7.95	22.64	17.95	0.75	4.69	2.76	3.08	F14, F16, F25	3/4	528
D2D 10	10	22.36	21.97	10.00	26.95	21.20	0.87	5.75	3.35	3.72	F16, F25, F30	1	836
D2D 12	12	25.51	24.80	11.97	29.76	23.62	0.87	6.14	3.74	4.13	F16, F25, F30, F35	1	1298
D2D 14	14	30.00	27.80	13.27	32.20	25.12	1.00	7.09	4.13	4.57	F25, F30, F35	1	1694
D2D 16	16	32.99	31.18	15.24	35.85	27.78	1.25	8.07	4.72	5.27	F25, F30, F35	1	2310
D2D 18	18	35.98	34.80	17.32	39.57	33.43	0.87	6.14	3.74	4.13	F25, F30, F35	1	2750
D2D 20	20	39.02	38.03	19.29	42.72	35.63	1.00	7.09	4.13	4.57	F25, F30, F35, F40	1	4290
D2D 24	24	45.00	44.49	23.23	48.39	40.31	1.25	8.07	4.72	5.27	F30, F35,F40	1	6820
D2D 28	28	52.99	52.76	27.17	52.09	43.23	1.25	8.86	5.31	5.87	F35,F40	1	11550
D2D 30	30	55.00	55.67	29.13	58.46	48.62	1.50	9.84	5.91	6.56	F35, F40, F48	1	12100
D2D 32	32	60.00	58.66	30.90	59.88	50.04	1.50	9.84	5.91	6.56	F35, F40	1	14740
D2D 36	36	68.00	66.30	34.65	67.72	56.69	1.50	11.02	6.50	7.16	F40, F48	1	19140

D1F, ASME CLASS 600

Type	Dimensions, mm										Plug NPTF	kg
	DN	A	ØB	ØD	E	K	M	N	ØO	P		
D1F 02	50	292	206	50	305	300	6.35	46	25	27.8	1/2	35
D1F 03	80	356	262	77	375	340	9.52	58	35	39.1	1/2	60
D1F 04	100	432	314	100	427	387	9.52	68	40	44.2	1/2	120
D1F 06	150	559	404	152	540	485	12.70	90	55	60.6	3/4	280
D1F 08	200	660	507	202	645	575	19.05	119	70	78.2	3/4	380
D1F 10	250	787	610	254	765	680	22.22	146	85	94.6	1	690
D1F 12	300	838	748	302	890	795	22.22	156	95	104.8	1	1134
D1F 14	350	889	824	340	970	865	25.40	180	105	116.1	1	1500
D1F 16	400	991	954	390	1068	948	31.75	205	120	133.8	1	2500
D1F 18	450	1092	1090	440	1200	1065	31.75	225	135	149.0	1	3300
D1F 20	500	1194	1176	490	1355	1205	38.10	250	150	166.6	1	3880
D1F 24	600	1397	1224	591	1440	1275	38.10	280	165	181.8	1	6500

Type	Dimensions, inch										Plug NPTF	lb
	Size	A	ØB	ØD	E	K	M	N	ØO	P		
D1F 2	2	11.50	8.11	1.97	12.01	11.81	0.25	1.81	0.98	1.09	1/2	77
D1F 3	3	14.02	10.31	3.03	14.76	13.39	0.37	2.28	1.38	1.54	1/2	132
D1F 4	4	17.01	12.36	3.94	16.81	15.24	0.37	2.68	1.57	1.74	1/2	264
D1F 6	6	22.01	15.91	5.98	21.26	19.09	0.50	3.54	2.17	2.39	3/4	616
D1F 8	8	25.98	19.96	7.95	25.39	22.64	0.75	4.69	2.76	3.08	3/4	836
D1F 10	10	30.98	24.02	10.00	30.12	26.77	0.87	5.75	3.35	3.72	1	1518
D1F 12	12	32.99	29.45	11.89	35.04	31.30	0.87	6.14	3.74	4.13	1	2495
D1F 14	14	35.00	32.44	13.39	38.19	34.06	1.00	7.09	4.13	4.57	1	3300
D1F 16	16	39.02	37.56	15.35	42.05	37.32	1.25	8.07	4.72	5.27	1	5500
D1F 18	18	42.99	42.91	17.32	47.24	41.93	1.25	8.86	5.31	5.87	1	7260
D1F 20	20	47.01	46.30	19.29	53.35	47.44	1.50	9.84	5.91	6.56	1	8536
D1F 24	24	55.00	48.19	23.27	56.69	50.20	1.50	11.02	6.50	7.16	1	14300



D2C + BC

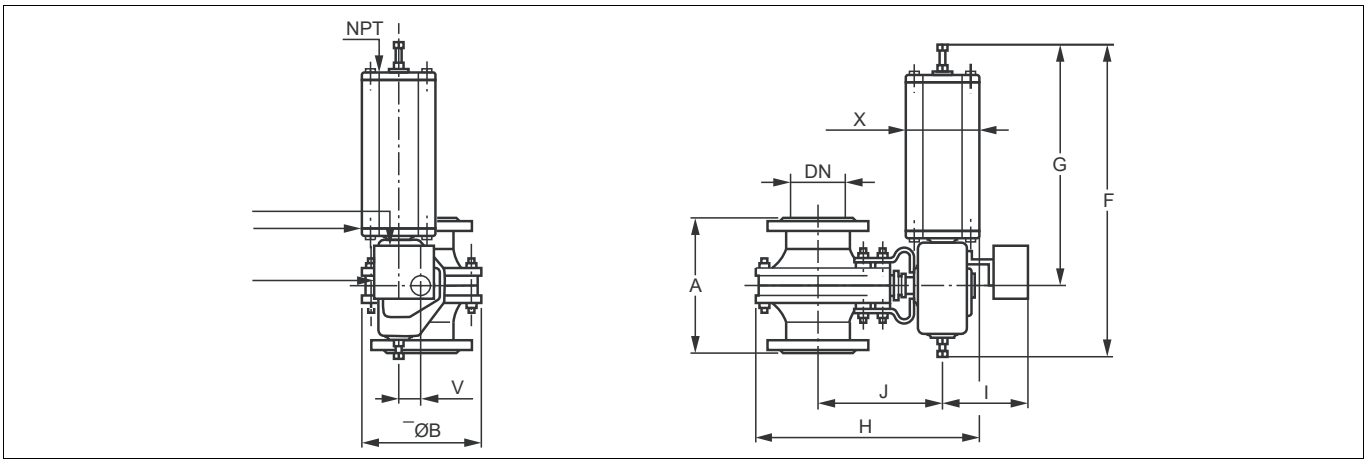
Type	Dimensions, mm										UNC	kg
	DN	A	B	F	G	H	I	J	V	X		
D2C 12 - BC25	300	610	596	1040	710	1215	310	752	121	265	1/2	560
D2C 12 - BC32	300	610	596	1330	910	1290	350	790	153	395	3/4	680
D2C 14 - BC25	350	686	668	1040	710	1313	310	813	121	265	1/2	690
D2C 14 - BC32	350	686	668	1330	910	1373	350	835	153	395	3/4	820
D2C 14 - BC40	350	686	668	1660	1150	1478	370	889	194	505	3/4	1015
D2C 16 - BC32	400	762	744	1330	910	1435	350	859	153	395	3/4	1340
D2C 16 - BC40	400	762	744	1660	1150	1515	370	889	194	505	3/4	1185
D2C 18 - BC40	450	864	814	1660	1150	1620	370	961	194	505	3/4	1775
D2C 18 - BC50	450	864	814	1970	1350	1735	415	1021	242	610	1	2160
D2C 20 - BC40	500	914	904	1660	1150	1719	370	1014	194	505	3/4	1975
D2C 20 - BC50	500	914	904	1970	1350	1839	415	1082	242	610	1	2360
D2C 24 - BC40	600	1067	1084	1660	1150	1943	370	1148	194	505	3/4	2795
D2C 24 - BC50	600	1067	1084	1970	1350	2048	415	1198	242	610	1	3180
D2C 28 - BC50	700	1244	1245	1970	1350	2324	415	1395	242	610	1	4680

D2D + BC

Type	Dimensions, mm										UNC	kg
	DN	A	B	F	G	H	I	J	V	X		
D2D 04 - BC13	100	305	262	645	445	619	235	394	65	175	3/8	96
D2D 04 - BC17	100	305	262	770	545	649	255	409	78	215	1/2	120
D2D 04 - BC20	100	305	262	840	575	689	270	428	97	215	1/2	140
D2D 06 - BC17	150	403	368	770	545	795	255	499	78	215	1/2	200
D2D 06 - BC20	150	403	368	840	575	830	270	518	97	215	1/2	220
D2D 08 - BC20	200	502	454	840	575	946	270	591	97	215	1/2	320
D2D 08 - BC25	200	502	454	1040	710	1006	310	614	121	265	1/2	380
D2D 10 - BC25	250	568	558	1040	710	1146	310	701	121	265	1/2	520
D2D 10 - BC32	250	568	558	1330	910	1221	350	738	153	395	3/4	645
D2D 12 - BC25	300	648	630	1040	710	1230	310	753	121	265	1/2	730
D2D 12 - BC32	300	648	630	1330	910	1305	350	790	153	395	3/4	855
D2D 14 - BC25	350	762	706	1040	710	1333	310	817	121	265	1/2	915
D2D 14 - BC32	350	762	706	1330	910	1393	350	839	153	395	3/4	1040
D2D 14 - BC40	350	762	706	1660	1150	1498	370	889	194	505	3/4	1255
D2D 16 - BC32	400	838	792	1330	910	1531	350	932	153	395	3/4	1330
D2D 16 - BC40	400	838	792	1660	1150	1611	370	960	194	505	3/4	1525
D2D 18 - BC40	450	914	884	1660	1150	1790	370	1092	194	505	3/4	1735
D2D 18 - BC50	450	914	884	1970	1350	1885	415	1136	242	610	1	2130
D2D 20 - BC40	500	991	966	1660	1150	1890	370	1154	194	505	3/4	2435
D2D 20 - BC50	500	991	966	1970	1350	1990	415	1198	242	610	1	2840
D2D 24 - BC40	600	1143	1130	1660	1150	2089	370	1249	194	505	3/4	3600
D2D 24 - BC50	600	1143	1130	1970	1350	2194	415	1299	242	610	1	3990
D2D 28 - BC50	700	1346	1340	1970	1350	2287	415	1393	242	610	1	6140
D2D 30 - BC50	750	1397	1414	1970	1350	2550	415	1535	242	610	1	6410

D1F + BC

Type	Dimensions, mm										UNC	kg
	DN	A	B	F	G	H	I	J	V	X		
D1F 02 - BC9	50	292	206	455	315	505	220	325	43	110	1/4	47
D1F 02 - BC11	50	292	206	540	375	510	225	324	51	135	3/8	52
D1F 02 - BC13	50	292	206	635	445	545	235	347	65	175	3/8	68
D1F 02 - BC17	50	292	206	770	545	575	255	362	78	215	1/2	91
D1F 03 - BC13	80	356	262	635	445	630	235	404	65	175	3/8	94
D1F 03 - BC17	80	356	262	770	545	660	255	419	78	215	1/2	120
D1F 03 - BC20	80	56	262	840	575	695	270	438	97	215	1/2	140
D1F 04 - BC13	100	432	314	635	445	700	235	448	65	175	3/8	155
D1F 04 - BC17	100	432	314	770	545	730	255	463	78	215	1/2	180
D1F 04 - BC20	100	432	314	840	575	765	270	482	97	215	1/2	200
D1F 04 - BC25	100	432	314	1040	710	825	310	505	121	265	1/2	255
D1F 06 - BC17	150	559	404	770	545	870	255	554	78	215	1/2	340
D1F 06 - BC20	150	559	404	840	575	915	270	573	97	215	1/2	360
D1F 06 - BC25	150	559	404	1040	710	960	310	596	121	265	1/2	415
D1F 06 - BC32	150	559	404	1330	910	1035	350	633	153	395	3/4	535
D1F 08 - BC20	200	660	507	840	575	1030	270	655	97	215	1/2	470
D1F 08 - BC25	200	660	507	1040	710	1090	310	678	121	265	1/2	525
D1F 08 - BC32	200	660	507	1330	910	1165	350	715	153	395	3/4	645
D1F 08 - BC40	200	660	507	1660	1150	1270	370	765	194	505	3/4	840
D1F 10 - BC25	250	787	610	1040	710	1245	310	775	121	265	1/2	835
D1F 10 - BC32	250	787	610	1330	910	1320	350	812	153	395	3/4	960
D1F 10 - BC40	250	787	610	660	1150	1420	370	862	194	505	3/4	1155
D1F 12 - BC32	300	838	748	1330	910	1498	350	923	153	395	3/4	1410
D1F 12 - BC40	300	838	748	1660	1150	1603	370	973	194	505	3/4	1605
D1F 12 - BC50	300	838	748	1970	1350	1703	415	1023	242	610	1	1990
D1F 14 - BC32	350	889	824	1330	910	1600	350	987	153	395	3/4	1890
D1F 14 - BC40	350	889	824	1660	1150	1705	370	1037	194	505	3/4	2085
D1F 14 - BC50	350	889	824	1970	1350	1805	415	1087	242	610	1	2470
D1F 16 - BC40	400	991	954	1660	1150	1850	370	1113	194	505	3/4	2980
D1F 16 - BC50	400	991	954	1970	1350	1945	415	1163	242	610	1	3370
D1F 18 - BC40	450	1092	1090	1660	1150	2025	370	1223	194	505	3/4	3820
D1F 18 - BC50	450	1092	1090	1970	1350	2125	415	1273	242	610	1	4210
D1F 20 - BC50	500	1194	1176	1970	1350	2300	415	1404	242	610	1	4810
D1F 24 - BC50	600	1397	1402	1970	1350	2385	415	1465	242	610	1	7360



D2C + BJ

Type	Dimensions, mm										UNC	kg
	DN	A	B	F	G	H	I	J	V	X		
D2C 12 - BJ25	300	610	596	1530	1200	1305	310	752	121	505	3/4	770
D2C 12 - BJ32	300	610	596	1830	410	360	350	790	153	540	1	1085
D2C 14 - BJ25	350	686	668	1530	1200	1403	310	813	121	505	3/4	900
D2C 14 - BJ32	350	686	668	1830	1410	1443	350	835	153	540	1	1220
D2C 16 - BJ32	400	762	744	1830	1410	1505	350	859	153	540	1	1390
D2C 18 - BJ32	450	864	814	1830	1410	1590	350	911	153	540	1	1970
D2C 20 - BJ32	500	914	904	1830	1410	1689	350	964	153	540	1	2170
D2C 24 - BJ32	600	1067	1084	1830	1410	1903	350	1098	153	540	1	2970
D2C 28 - BJ32	700	1244	1245	1830	1410	2192	350	1298	153	540	1	4470

D2D + BJ

Type	Dimensions, mm										UNC	kg
	DN	A	B	F	G	H	I	J	V	X		
D2D 04 - BJ16	100	305	262	990	760	674	255	409	78	265	1/2	160
D2D 04 - BJ20	100	305	262	1200	935	759	270	428	97	395	3/4	235
D2D 06 - BJ16	150	403	368	990	760	820	255	499	78	265	1/2	240
D2D 06 - BJ20	150	403	368	1200	935	900	270	518	97	395	3/4	315
D2D 08 - BJ20	200	502	454	1200	935	1016	270	591	97	395	3/4	415
D2D 08 - BJ25	200	502	454	1530	1200	1096	310	614	121	505	3/4	590
D2D 10 - BJ25	250	568	558	1530	1200	1236	310	701	121	505	3/4	730
D2D 10 - BJ32	250	568	558	1830	1410	1291	350	738	153	540	1	1050
D2D 12 - BJ32	300	648	630	1830	1410	1375	350	790	153	540	1	1260
D2D 14 - BJ32	350	762	706	1830	1410	1463	350	839	153	540	1	1440
D2D 16 - BJ32	400	838	792	1830	1410	1601	530	932	153	540	1	1720
D2D 18 - BJ32	450	914	884	1830	1410	1750	350	1036	153	540	1	1920

D1F + BJ

Type	Dimensions, mm										UNC	kg
	DN	A	B	F	G	H	I	J	V	X		
D1F 02 - BJ10	50	292	206	650	490	525	225	331	51	175	3/8	65
D1F 02 - BJ12	50	292	206	800	620	560	235	347	65	215	1/2	92
D1F 02 - BJ16	50	292	206	990	760	600	255	362	78	265	1/2	135
D1F 03 - BJ12	80	356	262	800	620	645	235	404	65	215	1/2	120
D1F 03 - BJ16	80	356	262	990	760	685	255	419	78	265	1/2	160
D1F 03 - BJ20	80	356	262	1200	935	770	270	438	97	395	3/4	235
D1F 04 - BJ12	100	432	314	800	620	715	235	448	65	215	1/2	180
D1F 04 - BJ16	100	432	314	990	760	815	255	463	78	265	1/2	220
D1F 04 - BJ20	100	432	314	1200	935	840	270	482	97	395	3/4	295
D1F 06 - BJ20	150	559	404	1200	935	975	270	573	97	395	3/4	455
D1F 06 - BJ25	150	559	404	1530	1200	1055	310	596	121	505	3/4	630
D1F 06 - BJ32	150	559	404	1830	1410	1105	350	633	153	540	1	950
D1F 08 - BJ25	200	660	507	1530	1200	1180	310	678	121	505	3/4	730
D1F 08 - BJ32	200	660	507	1830	1410	1235	350	715	153	540	1	1050
D1F 10 - BJ25	250	787	610	1530	1200	1335	310	775	121	505	3/4	1040
D1F 10 - BJ32	250	787	610	1830	1410	1390	350	812	153	540	1	1360
D1F 12 - BJ32	300	838	748	1830	1410	1568	350	923	153	540	1	1805
D1F 14 - BJ32	350	889	824	1830	1410	1670	350	987	153	540	1	2170

12 TYPE CODE

BALL VALVE, Series D

1.	2.	3.	4.	5.	6.	7.	8.	9.		10.	11.
D2	D	E	06	D	A	E	02	G	/	-	-

Q-CODE	PRODUCT OPTIONS
Q	Standard low noise trim for gas and liquid application, single seated (const. E or B) with open down stream side ball surface
Q2G	Q2-trim for gas application (single seated const.E or B)

1.	SERIES
D	Center split body, trunnion mounted, bonnet
	STANDARD
D2, D1(F)	Full bore, flanged
	NON-STANDARD
D3	Full bore, weld ends
D4	Reduced bore, weld ends
D5	Reduced bore, flanged

2.	PRESSURE RATING
C	ASME class 150
D	ASME class 300
F	ASME class 600

3.	CONSTRUCTION
	STANDARD
A	General construction, PTFE bearings, 2 seats, temperature range: -50 °C to +230 °C.
B	Single seated, one-way tight, metal bearings, temperature range: -50 °C to +450/600 °C
E	Single seated, one-way tight, PTFE bearings, temperature range: -50 °C to +230 °C
H	High-temperature construction, metal bearings, 2 seats, temperature range: -50 °C to +450/600 °C
	NON-STANDARD
C	Cryogenic construction, PTFE bearings, temperature range: -200 °C to +230 °C
S	Subsea construction
Z	OXYGEN CONSTRUCTION BAM tested non-metallic materials temperature range: -50 °C to +200 °C. See IMO '10O270EN.pdf'.
Y	Special construction

4.	SIZE (in)
D1F	02, 03, 04, 06, 08, 10, 12, 14, 16, 18, 20, 24, 28
D2D	04, 06, 08, 10, 12, 14, 16, 18, 20, 24, 26*, 28*, 30*, 32*, 36*
D2C	10, 12, 14, 16, 18, 20, 24, 28*, 30*, 36*
D5F	03, 04, 06, 08, 10, 12, 14, 16, 18, 20, 24
D5D	06, 08, 10, 12, 14, 16, 18, 20, 24, 28*, 30*, 32*, 36*
D5C	12, 14, 16, 18, 20, 24, 28*, 30*, 36*

*) Flanges acc. to ASME B16.47 series A in sizes 26" or larger.
Flanges in sizes up to NPS 24" are acc. to ASME B 16.5.

5.	BODY	BOLTING
	STANDARD MATERIALS	
A	CF8M	B8M / 8M
D	WCB	L7M / 2HM
Y	Special	

**) When soft seat, then ball without chrome.

6.	BALL
A	CF8M / AISI 316 + Chrome**
D	CF8M / AISI 316 + NiBo, only size ≤ 24"
Y	Special

7.	SEAT TYPE
T	Soft seat
D	Soft seat, fire safe
S	Metal seat
E	Metal seat
H	Bellows seat
C	Bellows seat
K	Solids Proof metal seat
R	Fire safe metal seat
F6	Special metal seat.

8.	STANDARD MATERIALS				
	Seat seal	Body gasket	Gland packing	Wound spring or bellows spring	
02	Viton GF	Graphite	Graphite	W	X-750
03		Graphite Graphite	Graphite Graphite	B W	W.no.1.4418 X-750
	NON-STANDARD MATERIALS				
63	Viton GF, graphite	Graphite	Graphite	W	X-750
64	Lip seal, grafoil	Graphite	Graphite	W	X-750

9.	PACKING CONSTRUCTION CODE
G	Standard packing, live loaded graphite packing, ISO 15848-1 certified
-	Non-live loaded packing. Obsolete.

10.	FLANGE FACING
-	ASME B16.5 raised face Ra 3.2-6.3 or EN 1092-1 Type B1 (Ra 3.2-12.5) (without sign)
05	Ring Joint

11.	FLANGE DRILLING
-	Acc. to valve pressure rating, without sign (standard)
C	ASME class 150***
D	ASME class 300***
F	ASME class 600***
J	EN PN 10
K	EN PN 16
L	EN PN 25
M	EN PN 40
N	EN PN 64
P	EN PN 100
R	JIS 10K
S	JIS 16K
T	JIS 20K
U	JIS 30K
W	JIS 40K
Y	Special

***) Flange drilling acc. to ASME B16.47 series A in sizes 26" or larger.
Flange drilling in sizes up to NPS 24" are acc. to ASME B 16.5

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